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Bibliometric analysis of articles on meniscal transplantation

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ABSTRACT

Aims: The aims of this study is to contribute to the literature by performing a bibliometric analysis of the articles written about meniscal transplantation worldwide.

Methods: Studies indexed in the Science Citation Index Expanded and Emerging Sources Citation Index of the Web of Science database from 1986 to 2024 have been examined. The analysis included the number of articles by year, country, publisher, citation count, and journal of publication.

Results: A total of 577 articles indexed as SCI-E and ESCI were identified in the WoS database. These articles were contributed from a diverse range of countries, with the number of articles increasing over time.

Conclusion: Meniscus transplantation is a topic that has become popular over time. It is reasonable to posit that this trend will continue in the near future.

Keywords: Bibliometric analysis, meniscus, transplantation, allograft, publications

INTRODUCTION

It is known that the meniscus is one of the most significant tissues of the knee joint. The menisci perform a number of crucial functions, including distributing the load on the tibiofemoral joint, adapting the femur and tibia bones in the knee joint, nutritional and lubrication support for the cartilages.[1-4] The meniscus tissue is an indispensable component of the knee joint, as it possesses a unique structure that is not found in any other part of the body. Consequently, it cannot be replaced by another tissue in the event of injury. In the extended position of the knee, the medial meniscus bears 50% of the load of the medial compartment, while the lateral meniscus bears 70% of the load of the lateral compartment. When the knee is flexed, the aforementioned 70% ratio increases to 85%.[5] Given that the lateral meniscus is subjected to greater forces, the contact area between the opposing surfaces is reduced by 40-50% following total lateral meniscectomy, resulting in a contact force of 200-300% on the articular surfaces. Meniscectomies are a common surgical procedure. In the majority of cases, less than 50% of the meniscus is removed. However, in the case of bucket handle-type tears, in which more than 50% of the meniscus is removed, the use of meniscal allograft transplants (MAT) becomes a viable option.[6,7]

The initial MAT surgery in humans was conducted by Milachowski et al.[8] in 1984, with the results of experimental and clinical studies on this case and subsequent cases published in 1989. In their experimental studies, they transplanted lyophilised gamma-sterilised allogenic menisci to the first group of 15 sheep and deep-frozen menisci to the other group. While complete remodelling was obtained in the first group, they reported that they obtained non-remodelled but functionally complete menisci in the second group. In their clinical studies, better results were generally obtained with deep-frozen allografts. Subsequently, numerous experimental and clinical studies have been conducted on indications, graft preservation methods, surgical technique and approach in the case of concomitant chondral and ligamentous injuries.[2,3,7]

MAT is indicated in patients with a stable knee joint, cartilage damage of less than grade 3 according to ICRS, no malalignment and pain in the knee compartment affected by the meniscal defect. MAT is an evolving surgical option for symptomatic meniscal deficiency with good overall clinical outcomes and high rates of patient satisfaction.[7]

Bibliometric analyses are an effective method for tracking long-term research trends in a field.[9-12] This method enables

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objective evaluation of research contributions by different countries, institutions, journals, and authors in the scientific field. It further facilitates analysis of research trends and identification of current perspectives.

METHODS

A bibliometric study is an open data study. It does not contain any personal data. Ethics committee approval is not required. All procedures were carried out in accordance with the ethical rules and the principles.

Numerous online databases are available for bibliometric analysis. This study chose Web of Science (WoS), Science Citation Index Expanded (SCI-E), and Emerging Sources Citation Index (ESCI) for their high scientific quality and reliability. For the document type, 'article' was selected. The WoS database was accessed on 1 June 2024, retrieving articles related to meniscus transplantation from around the world between 1986 and June 2024.

Search terms, selected from the MESH library, were: "meniscus transplantation" (all fields) OR "menisci transplantation" (all fields) OR "meniscal transplantation" (all fields) OR "meniscus allograft transplantation" (all fields) OR "menisci allograft transplantation" (all fields) OR "meniscal allograft transplantation" (all fields). The literature, filtered using exclusion criteria from the study plan, was downloaded in Word and Excel file formats. The data obtained were then analyzed. Bibliometric parameters such as publication year, language used, first author's name, country of publication, total citations, journal title, and affiliated institutions were considered in the evaluation.

Excel files were utilized to create graphs and tables, employing percentage and frequency values for table creation. In addition to Scopus and WoS database's own graphs, the VOSviewer tool (Leiden University, The Netherlands) was used to produce bibliometric networks and visualizations.[13,14]

RESULTS

A total of 577 articles indexed as SCI-E and ESCI were identified in the WoS database. The first of these articles was published in 1986. The first year in which the number of publications exceeded 20 was 2012. A total of 16 articles were published until June 2024. The number of publications according to years is presented in Table 1.

A total of 52 countries contributed to the literature. The USA, South Korea and Germany were the largest contributors (Figure 1). It was observed that five languages were used in the articles: English, German, French, Portuguese and Czech. The data on the languages of the articles are presented in Table 2. 505 (87.52%) of the articles were indexed in SCI-E and 72 (12.48%) in ESCI.

A total of 122 different journals published the articles. The American Journal of Sports Medicine (92 articles), Knee Surgery Sports Traumatology Arthroscopy (86 articles), and Arthroscopy: The Journal of Arthroscopic and Related Surgery (75 articles) were the journals where the most articles were published. Table 3 shows the journals with 10 or more articles. The publishers with the greatest number of articles were Elsevier (180 articles), Springer Nature (143 articles), and Sage (113 articles). The top 10 publishers with the greatest number of articles are shown in Table 4.

Table 1. Distribution of the number of articles by years

Publication years	Record count	% of 577
2024	16	2.773
2023	35	6.066
2022	37	6.412
2021	33	5.719
2020	39	6.759
2019	37	6.412
2018	28	4.853
2017	34	5.893
2016	31	5.373
2015	36	6.239
2014	26	4.506
2013	13	2.253
2012	26	4.506
2011	18	3.120
2010	16	2.773
2009	9	1.560
2008	14	2.426
2007	16	2.773
2006	18	3.120
2005	6	1.040
2004	10	1.733
2003	15	2.600
2002	13	2.253
2001	3	0.520
2000	8	1.386
1999	11	1.906
1998	1	0.173
1997	7	1.213
1996	3	0.520
1995	5	0.867
1994	6	1.040
1993	3	0.520
1992	1	0.173
1989	1	0.173
1988	1	0.173
1986	1	0.173

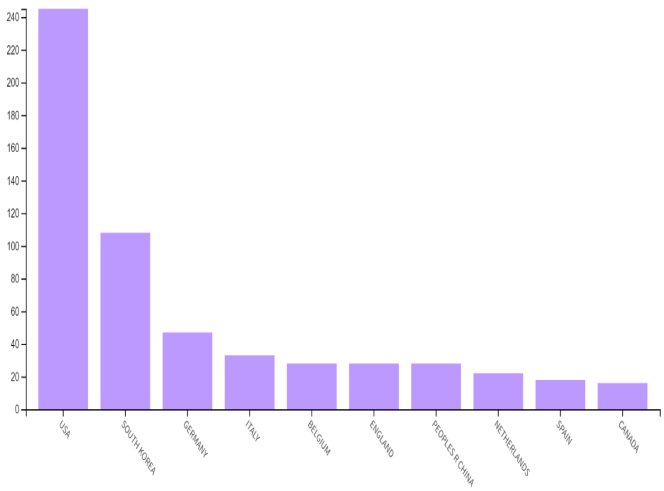

Figure 1. Top 10 countries with the most articles published

Table 2. Distribution of articles according to language of writing

Languages	Record count	% of 577
English	553	95.841
German	19	3.293
French	2	0.347
Portuguese	2	0.347
Czech	1	0.173

Table 3. Journals publishing more than 10 articles

Publication titles	Record count	% of 577
American Journal of Sports Medicine	92	15.945
Knee Surgery Sports Traumatology Arthroscopy	86	14.905
Arthroscopy the Journal of Arthroscopic and Related Surgery	75	12.998
Arthroscopy Techniques	29	5.026
Orthopaedic Journal of Sports Medicine	19	3.293
Knee	15	2.600
Operative Techniques in Sports Medicine	15	2.600
Journal of Knee Surgery	12	2.080

Table 4. Top 10 publishers publishing the most articles

Publishers	Record count	% of 577
Elsevier	180	31.196
Springer Nature	143	24.783
Sage	113	19.584
Lippincott Williams & Wilkins	30	5.199
Wiley	17	2.946
Thieme Medical Publishers	16	2.773
Amer Orthopaedic Soc Sport Med	7	1.213
MDPI	7	1.213
British Editorial Soc Bone Joint Surgery	6	1.040
Taylor & Francis	4	0.693

The total number of citations received by 577 articles was 15,625. The average number of citations per article was 27.08. The most cited article was that published by Milachowski et al.[8] in 1989, with 300 citations. Figure 2 presents the combined

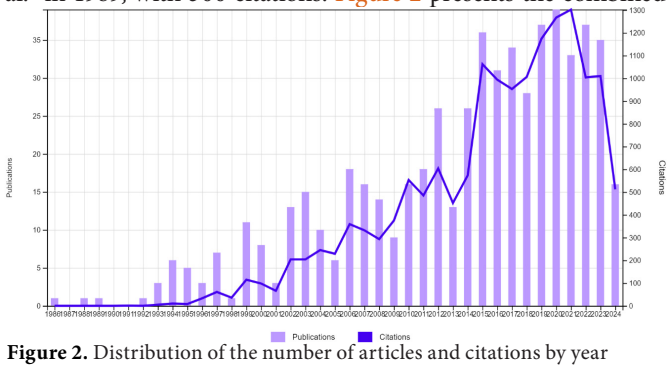

Figure 2. Distribution of the number of articles and citations by year

change in the number of articles and citations by year.

Results of Analyzing the WoS Database with the VOSviewer

Keyword analysis: The WoS database was examined using the VOSviewer application to identify and analyse frequently occurring keywords. A total of 766 unique keywords were identified that occurred at least once. The size of each node represents the frequency of each keyword, while the lines connecting the nodes show co-occurrence relationships (Figure 3). The most frequently occurring keywords were

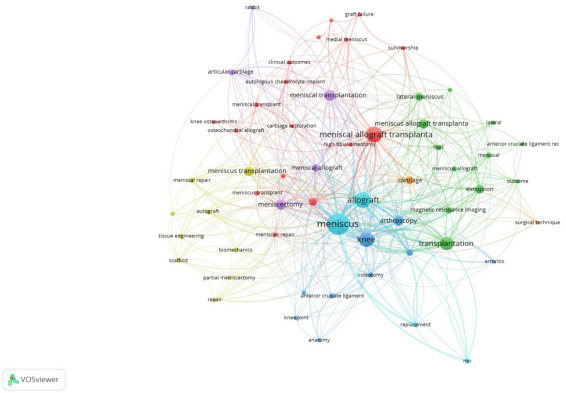

Figure 3. VOSviewer results of keyword analysis

meniscus (162 occurrences), allograft (86 occurrences), knee (76 occurrences) and transplantation (61 occurrences).

DISCUSSION

The initial publication on MAT was a study on animals in 1986, and the first study on humans was published in 1989. Over the following two decades, a mere 19.4% of all articles on MAT were published. In contrast, 27.7% of all published articles on MAT have been produced in the past five years. This demonstrates that there has been a rapid increase in the interest in meniscal transplantation, which is a topic of great current interest. Similarly, it can be anticipated that this trend will continue in the coming years. The relatively low number of articles published over the 20-year period following the initial publication may be attributed to the fact that a novel and challenging surgical technique had only recently been introduced and was just beginning to be applied by surgeons, in addition to the potential inadequacies in equipment and graft supply.

The contributions and impact of countries in the field of science can be quantified through bibliometric studies. Upon analysis of the WOS database, the results indicated a pronounced dominance of the USA. Upon analysis of the top-ranked countries, it becomes evident that there is a discernible correlation between their financial development and their contribution to science.

English is the dominant language of publication in the WOS database, with a rate of 87.52%. It can therefore be concluded that English is the most widely used language for scientific literature.

One of the most significant challenges for authors is idenitifying suitable journals for their articles. Bibliometric studies can provide valuable insights in this regard. In this regard, bibliometric studies provide valuable insights. Upon examination of the publishers and journals that have published the most articles on MAT, it becomes evident that these are highly regarded and well-established publishers (e.g., Elsevier, Springer Nature, Sage) and journals (e.g., The American Journal of Sports Medicine, Knee Surgery Sports Traumatology Arthroscopy, Arthroscopy: The Journal of Arthroscopic and Related Surgery). This information serves as a valuable guide for researchers in terms of publishing subsequent studies.

Keywords are important for understanding what readers are looking for and what information you need to provide to

meet their needs. The most frequently occurring keywords in the field of meniscus allograft transplantation are meniscus, allograft, knee and transplantation. The terms in question exhibit a general expression. As more articles are incorporated, it is anticipated that keyword frequencies will cluster around more specific words.

CONCLUSION

The findings of this study will assist in the review and evaluation of the existing literature on meniscal transplantation. This subject, which has gained considerable momentum in recent times, will continue to gain importance as surgical experience increases and the influence of biomedical and material engineering grows.

ETHICAL DECLARATIONS

Ethics Committee Approval

A bibliometric study is an open data study. It does not contain any personal data. Ethics committee approval is not required.

Informed Consent

A bibliometric study is an open data study. It does not contain any personal data. Informed consent is not required.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

There was no external funding for the study.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper and that they have approved the final version.

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